

PATENT SPECIFICATION

655,856



Date of filing Complete Specification July 14, 1949.

Application Date July 14, 1948.

No. 18868/48.

Complete Specification Published Aug. 1, 1951.

Index at acceptance — Class 97(i), J1.

PROVISIONAL SPECIFICATION

Improvements relating to Optical Apparatus for Educational and Demonstration Use

We, W. & J. GEORGE & BECKER
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SPECIFICATION NO. 655,856
INVENTOR:— RICHARD HENRY MORRIS

By a direction given under Section 17(1) of the Patents Act 1949 this application proceeded in the name of W & J. George & Becker Limited, a British Company, of 157, Great Charles Street, Birmingham, 3.

THE PATENT OFFICE,
13th September, 1951.

DS 93169/2(12)/3576 160 9/51 R

accommodating lenses, mirrors and other components of varying sizes.

With optical apparatus of the kind aforesaid as heretofore constructed, it has 20 been the general practice to provide for the vertical adjustment of the holders for lenses and other optical components relatively to the respective base sections of the said holders so as to admit of the 25 optical centres being located on a common line.

The provision for vertical adjustment, however, is open to objection in that it necessarily involves a potential loss of 30 accuracy due to possible errors of fit and the exaggeration of errors caused by the member which is vertically adjustable not being at right angles to the plane from which measurements are made.

35 The present invention has for its object to provide improved apparatus which is not subject to the disadvantages hereinbefore referred to.

According to the invention, improved 40 optical apparatus for educational and demonstration use incorporates a base provided with a slideway and self centring holders for components of variable size and holders with fixed locations 45 for diaphragm plates and other standardised optical components carried by base sections which are slidably mounted on the base but which do not pinch for adjustment of the holding sec-

fixed location for diaphragm plates and 55 other standardised optical components.

Each self centring holder comprises an annular frame preferably of non-metallic material which is carried by a relatively short saddle adapted to slide within the 70 slide-ways of the calibrated base aforesaid. This annular frame is provided in one face with an annular recess the inner boundary of which is constituted by the 75 inner periphery of the frame.

Turnably mounted within the recess aforesaid is a metal annulus of substantially the same dimensions as the recess and pivotted to this annulus at three equidistantly spaced positions are 80 strip metal arms, the inner ends of which project towards the centre of the gapped portion of the annulus and which at their inner ends carry cranked parts to which are attached grooved pads of rubber, said 85 grooves being located in the mean plane of the annulus.

The outer ends of the arms are forked and these forked portions engage the shanks of headed screws which are driven 90 into the frame and which in conjunction with the arms serve to hold the annulus within the frame.

The annulus is provided with an operating arm which tends to move into abutment with a stop screw carried by the frame under the influence of an inclined coil spring one end of which is anchored 95

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PROVISIONAL SPECIFICATION

Improvements relating to Optical Apparatus for Educational and Demonstration Use

We, W. & J. GEORGE & BECKER LIMITED of 157, Great Charles Street, Birmingham, 3, a Company incorporated under the Laws of Great Britain, and **3** RICHARD HENRY MORRIS, of the Company's address and a British Subject, do hereby declare the nature of this invention to be as follows:—

This invention has reference to **10** improvements relating to optical apparatus for educational and demonstration use and is concerned more particularly with optical apparatus for the said purpose which is known as an optical bench **15** and which is required to be capable of accommodating lenses, mirrors and other components of varying sizes.

With optical apparatus of the kind aforesaid as heretofore constructed, it has **20** been the general practice to provide for the vertical adjustment of the holders for lenses and other optical components relatively to the respective base sections of the said holders so as to admit of the **25** optical centres being located on a common line.

The provision for vertical adjustment, however, is open to objection in that it necessarily involves a potential loss of **30** accuracy due to possible errors of fit and the exaggeration of errors caused by the member which is vertically adjustable not being at right angles to the plane from which measurements are made.

35 The present invention has for its object to provide improved apparatus which is not subject to the disadvantages hereinbefore referred to.

According to the invention, improved **40** optical apparatus for educational and demonstration use incorporates a base provided with a slideway and self centring holders for components of variable size and holders with fixed locations **45** for diaphragm plates and other standardised optical components carried by base sections which are slidably mounted on the base but which do not pinch for adjustment of the holding sec-

tions relatively to the respective base sections, said holding sections having their centres located at precisely the same height above the base whereby it is ensured that the optical centres of all components held by the holding sections **50** aforesaid shall lie on the same line.

According to an embodiment of the invention the improved apparatus incorporates a heavy base provided with longitudinal slideways calibrated in measurements of length upon which are adapted to be longitudinally slideable self-centring holders for components of varying sizes such as lenses and holders with fixed location for diaphragm plates and **55** other standardised optical components.

Each self centring holder comprises an annular frame preferably of non-metallic material which is carried by a relatively short saddle adapted to slide within the **60** slide-ways of the calibrated base aforesaid. This annular frame is provided in one face with an annular recess the inner boundary of which is constituted by the **65** inner periphery of the frame. **70**

Turnably mounted within the recess aforesaid is a metal annulus of substantially the same dimensions as the recess and pivotted to this annulus at three equidistantly spaced positions are **75** strip metal arms, the inner ends of which project towards the centre of the gapped portion of the annulus and which at their inner ends carry cranked parts to which are attached grooved pads of rubber, said **80** grooves being located in the mean plane of the annulus.

The outer ends of the arms are forked and these forked portions engage the shanks of headed screws which are driven **85** into the frame and which in conjunction with the arms serve to hold the annulus within the frame.

The annulus is provided with an operating arm which tends to move into abutment with a stop screw carried by the frame under the influence of an inclined coil spring one end of which is anchored **90** **95**

to the frame and the other end to the annulus.

When the operating arm aforesaid is in contact with the stop screw the inner ends of the arms occupy their innermost positions.

The self centring holder just described is employed as follows:—

When it is desired, for example, to engage a lens within the holding means the operating arm is pressed away from the stop screw thereby occasioning a turning of the annulus within the recess in the frame in opposition to the resistance afforded by the coil spring. This turning of the annulus relatively to the frame through the resultant reaction between the forked ends of the arms and the screws engaged thereby turns the arms about their respect pivots so that the inner ends move outwardly.

The turning movement is continued until the periphery of the lens to be mounted can be inserted between the gripping pads with the edge of the lens in register with the grooves in the said pads, whereupon the operating arm is released to allow the contra-rotation of the annulus under the energy stored in the coil spring whereby the gripping pads move into firm gripping contact with the edge of the lens and automatically align the focal axis of the lens with the axis of the annulus.

Diaphragm plates and similar standardised components are adapted to be interchangeably mounted in known manner within annular holding sections of fixed location which are carried by integral base saddles which also are longitudinally slidable within the slideways of the base.

The diaphragm plates aforesaid are as is usual provided with holes for the accommodation of prisms and other optical components.

The centres of the annular frames of the self centring holders and the centres

of the annular holding sections of the holders of fixed location for the diaphragm plates and other standardised components are precisely the same height above the base and consequently when a lens or other object is held in the self centring holder the optical centre of the gripped lens is self centred on the optical axis of the diaphragm plate or other component associated with the said diaphragm plate carried by the holder of fixed location in which the said plate or component is mounted.

It will be appreciated that the self centring holding means is adaptable to a wide range of lenses and is applicable to the holding both of concave and convex lenses and also of other circular objects required to be mounted on an optical bench, such as screens, diaphragms, mirrors and object holders, and that, since this self centring holding means and the holding means with fixed locations do not require vertical adjustment, only relatively short mounting saddles are required, thus enabling more accurate and rigid mounting to be obtained on an optical bench than with holding means for the said purpose heretofore in use.

In addition, it is to be understood that optical components such, for example, as light sources, index rods, collimators or telescopes, may be fixed permanently to their own individual saddles at such a height as to place such components on the common optical axis of those components which are secured in the self centring holders or held on the diaphragm plates or by other holding means with fixed locations.

Dated this 13th day of July, 1948.

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COMPLETE SPECIFICATION

Improvements relating to Optical Apparatus for Educational and Demonstration Use

We, W. & J. GEORGE & BECKER LIMITED, of 157, Great Charles Street, Birmingham, 3, a Company incorporated under the laws of Great Britain, and RICHARD HENRY MORRIS, of the Company's address and a British subject, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention has reference to improvements relating to optical apparatus for educational and demonstration use and is concerned more particularly with optical apparatus for the said purpose which is known as an optical bench and which is required to be capable of accommodating lenses, mirrors and other components of varying sizes.

With optical apparatus of the kind aforesaid as heretofore constructed, it

has been the general practice to provide for the vertical adjustment of the holders for lenses and other optical components relatively to the respective base sections 5 of the said holders so as to admit of the optical centres of the lenses or other components being located on a common line.

The provision for vertical adjustment, 10 however, is open to objection in that it necessarily involves a potential loss of accuracy due to possible errors of fit and the exaggeration of errors caused by the member which is vertically adjustable 15 not being at right angles to the plane from which measurements are made.

The present invention has for its object 20 to provide improved apparatus which is not subject to the disadvantages hereinbefore referred to.

According to the invention improved 25 optical apparatus for educational and demonstration use incorporates a base provided with a slideway, optical components, and circular holders for said optical components carried by saddles which are slidably mounted on the slide-way but which do not provide for adjustment of the holding sections of the 30 holders relatively to the respective saddles, said circular holders having their centres located at precisely the same height above the respective saddles and the said components when held by the 35 holders with the saddles mounted on the slideway aforesaid being arranged on the same optical axis.

The invention will now be described 40 with particular reference to the accompanying sheets of drawings wherein:—

Figure 1 is a perspective view of optical apparatus in accordance with the invention as set up for educational and demonstration purposes.

Figure 2 is a front elevation of a 45 holder for holding components with fixed locations as utilised in the apparatus depicted in Figure 1.

Figure 3 is an end view partly sectioned of the holder illustrated in Figure 2.

Figure 4 is an underside plan view of the holder illustrated in Figures 2 and 3.

Figure 5 is a front elevation of a self centring holder as adapted for holding a lens and as utilised in the apparatus depicted in Figure 1.

Figure 6 is an end view partly sectioned of the self-centring lens holder 60 illustrated in Figure 5.

Figure 7 is a similar view to Figure 5 but showing a lens gripped by the holder.

Figure 8 is a front elevation of a screen adapted for fitting in the holder illustrated in Figures 2 and 3 and as

employed in the apparatus as set up in Figure 1.

Figure 9 is an edge view of Figure 8.

Figure 10 is a front view of a pointer plate adapted for mounting in the holder 70 illustrated in Figures 2—4.

Figure 11 is an edge view of Figure 10.

Figure 12 is a front view of an aperture plate for mounting in the holder 75 illustrated in Figures 2—4 and as employed in the apparatus as set up in Figure 1 and

Figure 13 is an edge view of Figure 12.

In the drawings like numerals of 80 reference indicate similar parts in the several view.

According to the illustrated embodiment of the invention the improved apparatus incorporates a base consisting 85 of a pair of parallel longitudinally arranged tubular slideways 15 the ends of which are secured within base blocks 16 having feet 16a whereby the base may be supported on the work bench.

The longitudinal slideways 15 are 90 adapted to receive a plurality of holders for optical components four of which are depicted in Figure 1, and are indicated in the said Figure by the reference letters A, B, C and D, A being a holder for a pointer component with fixed location, B a self-centring holder for lenses or other optical components, of varying sizes, C a holder for an object component with fixed location and D a holder for a screen component with fixed location.

Each holder A, B, C and D incorporates 95 an annular frame 17 preferably of a non-metallic material provided at the lower end with a short pillar section 17a which is adapted to be bolted to a transversely arranged saddle 18.

Each saddle 18 is provided at one end with a depending bifurcated hooked portion 18a and a depending intermediate 110 portion 18b to which is fixed the central portion of a longitudinally arranged blade spring 19.

The opposite end of the saddle 18 is 115 recessed as at 18c and is provided at the centre of the said recess with a projection 18d.

The slideways 15 are calibrated in terms of linear measurement and the calibrations co-operate with sloping 120 scales 18e fixed between the arms of the hooked portions 18a.

The saddles 18 are adapted to be engaged with one of the longitudinal slideways 15 by hooking the hooked portions 18a of the saddles on to a slideway 15 with the springs 19 bearing on the portion of the slideway 15 opposite to that engaged by the hooked portions 18a and then allowing the projections 18d to 130

rest on the opposite slideway 15.

When mounted as aforesaid the saddles are located in a horizontal plane with the centres of the annular frames 17 on the same optical axis.

The holders A, C and D are identical to one another in construction and the annular frame 17 of each holder is recessed as at 17b for the accommodation 10 of a sheet metal mounting plate A1, C1, D1 (see Figures 8—13).

The annular frame 17 of each holder A, C, D has mounted in the upper end thereof a vertically disposed screw 20 having a knurled head and is provided at the lower end with an outwardly projecting screw 21. Each mounting plate A1, C1, D1 is provided with a recess 22 so that by engaging the recessed portion of 20 a mounting plate behind the head of the relevant screw 21 and pressing the mounting plate within the recess 17b and then screwing down the screw 20 the mounting plates can be held within the annular frames 17 with their centres all located 25 on a common optical axis.

The mounting plate A1 is annular and incorporates a pointer 23 which is slidably mounted in a screw operated 30 clamping member 24 so that the point of the said pointer may be adjusted as required.

The mounting plate C1 is annular and has a grid object plate 25 screwed to the 35 centre thereof whilst the mounting plate D1, is a simple opaque or translucent screen.

The self-centring holder B as depicted in Figure 1 is intended solely for the 40 mounting of lenses and other optical components such as mirrors and for this purpose the annular frame 17 which generally is similar to the frames already described in connection with the holders 45 A, C and D has turnably mounted in the recessed portion 17b thereof a metal annulus 26. Figures 5—7. of substantially the same diameter and depth as that of the recess 17b and pivoted to this annulus 26 at three equidistantly spaced positions are strip metal arms 27 the inner ends of which project towards the centre of the gapped portion of the annulus 26 and carry at their inner ends grooved 50 pads of rubber 27a the grooves in which are located in the mean vertical plane of the annulus 26.

The outer ends of the arms 27 are 55 pivoted to the annular frame 17.

The annulus 26 has anchored thereto one end of a spring 28 the other end of which is anchored to the annular frame 17, said spring 28 tending to maintain the inner ends of the arms 27 in the position indicated in Figure 5.

The annulus 26 is also provided at the lower portion with an operating thumb piece 26a.

When it is desired to mount a lens in a holder 17 the thumb piece 26a is pressed to cause the arms 27 to move away from the centre to permit of the positioning of the lens 31 so that upon releasing the thumb piece 26a the lens 31 is gripped and self-centred by the grooved pads 27a at the ends of the arms 27.

An ordinary incandescent lamp holder 29 is mounted on a saddle 18 generally similar to the saddles 18 employed in connection with the holders A, B, C and D, and receives an incandescent electric lamp 30 of the elongated filament type constituting the source of illumination.

It will be appreciated that since the centres of the annular frames 17 of the holders A, C and D are at precisely the same height above the base and that since when a lens or other object is held in the self-centring holder B the optical centre of the gripped lens is then also self-centred on the optical axis, the whole of the components are centred on a common optical axis.

It will be appreciated also that the holders A, C permit of the interchange 95 of component plates without requiring any adjustment of an individual component.

It will be appreciated further that the self-centring holders B are adapted to 100 the holding of a wide range of concave and convex lenses, mirrors and other optical components whilst the other holders A, C, D are capable of receiving a wide range of optical components such 105 as screens, diaphragms, mirrors and object holders.

Moreover it will be appreciated that since only relatively short pillar sections 110 17a and saddles 18 of shallow depth are required accurate and rigid mounting of the components is ensured.

Further it will be appreciated that in addition to the components described and illustrated other components such as collimators or telescopes may be fixed permanently to their own individual saddles 18 again at such a height as to maintain the components on the common optical axis of those components which for the 120 time being are carried by a self-centring holder or holders with fixed locations.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed we declare that what we claim is:—

1. Optical apparatus for educational and demonstration use incorporating a 130

base provided with a slideway, optical components, and circular holders for said optical components carried by saddles which are slidably mounted on the slideway but which do not provide for adjustment of the holding sections of the holders relatively to the respective saddles, said circular holders having their centres located at precisely the same height above the respective saddles and the said components when held by the holders with the saddles mounted on the slideway aforesaid being arranged on the same optical axis.

15. 2. Optical apparatus for educational and demonstration use according to Claim 1 in which the slideway is constituted by a pair of parallel members.

3. Optical apparatus for educational and demonstration use according to Claim 1 in which each holder incorporates an annular frame provided with a recess for the accommodation of a mounting or holding means for an optical component and in which the said annular frames have their centres located at precisely the same height above the respective saddles.

4. Optical apparatus for educational and demonstration use according to Claim 1 wherein the saddles are adapted to have a hooked engagement with a slideway.

5. Optical apparatus for educational and demonstration use according to Claim 1 and Claim 4 in which the saddles are formed at one end with a portion adapted to have a hooked engagement with one slideway whilst the opposite end is adapted to rest on the complementary slideway.

6. Optical apparatus for educational and demonstration use according to Claim 5 in which the hooked portions of the saddle co-operate with spring means for retaining the saddles on the relevant slideway.

7. Optical apparatus for educational and demonstration use according to Claim 3 in which the recess is adapted to accommodate interchangeable plates which either themselves constitute optical components or which serve as mountings for optical components.

8. Optical apparatus for educational and demonstration use according to the preceding Claim 7 wherein an annular frame has mounted in one part thereof a screw the nose of which can project within the recess and is provided at another part with a projecting means adapted to engage a locating means associated with a mounting plate.

9. Optical apparatus for educational and demonstration use according to Claim 3 in which there is turnably mounted within the recess of an annular frame an annulus and in which the said annular frame and annulus have a pivotal association with a plurality of arms the inner ends whereof are located within the apertured portion of the annulus and in which spring means is provided which tends to cause the inwardly directed ends of the said arms to meet.

10. Optical apparatus for educational and demonstration use according to the preceding Claim 9 wherein the arms are provided at the inner ends with grooved pads.

11. Optical apparatus for educational and demonstration use constructed, arranged and adapted for use substantially as herein described and illustrated in the accompanying drawings.

12. A holder for optical components for use with the optical apparatus claimed in Claim 1 constructed, arranged and adapted for use substantially as herein described with particular reference to Figures 2, 3, 4, 8, 10, 11, 12 and 13 of the accompanying sheets of drawings.

13. A holder for optical components for use with the optical apparatus claimed in Claim 1 constructed, arranged and adapted for use substantially as herein described and illustrated in Figures 5, 6 and 7 of the accompanying drawings.

Dated this 13th day of July, 1949.
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Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press--1951.
 Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which
 copies, price 2s. per copy; by post 2s. 1d., may be obtained.

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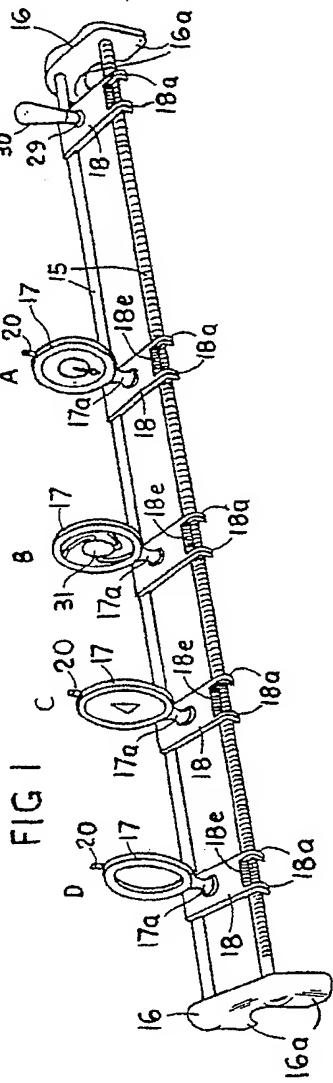


FIG 1

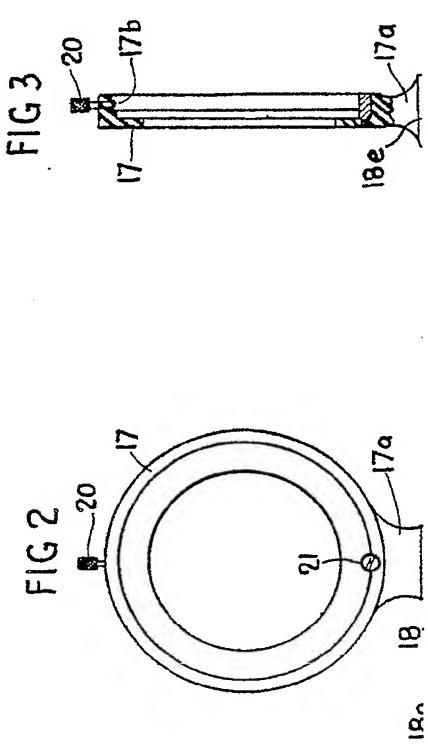


FIG 2

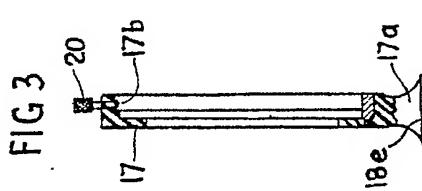


FIG 3

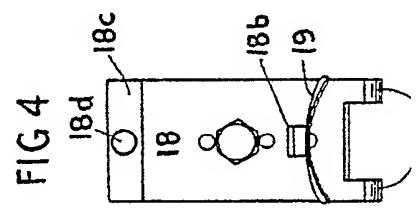


FIG 4

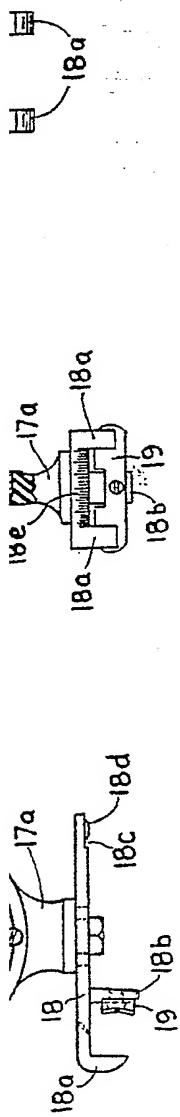


FIG. 5

FIG. 6

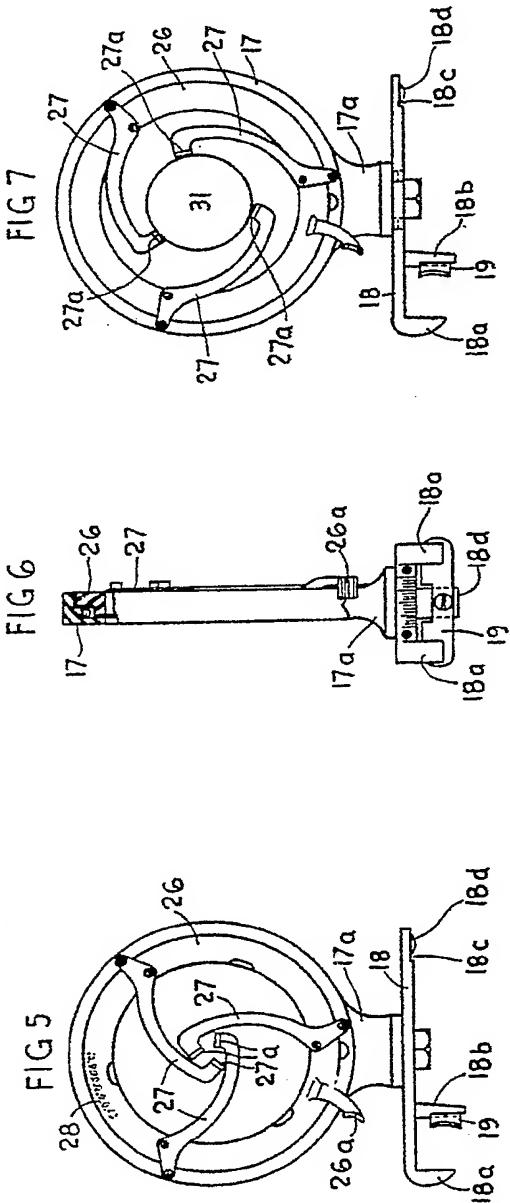


FIG. 7

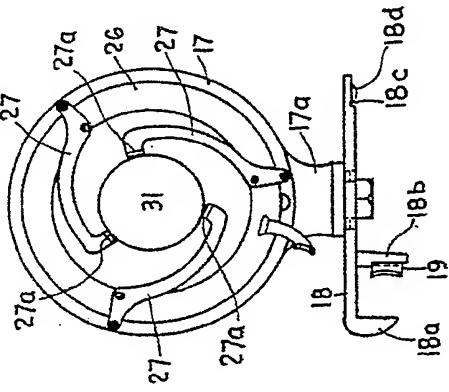


FIG. 13

FIG. 12

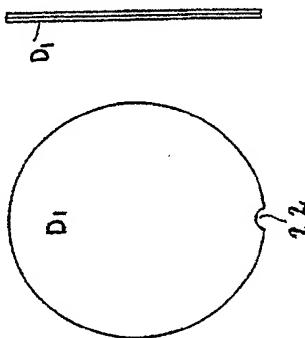


FIG. 11

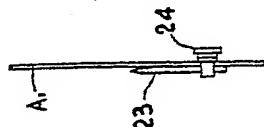


FIG. 10

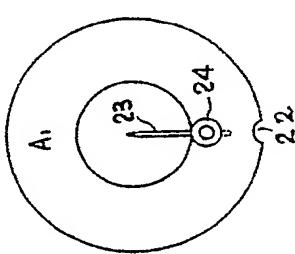
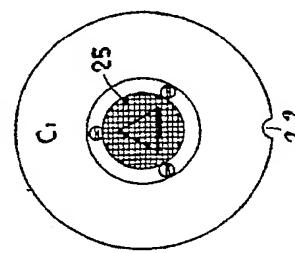


FIG. 9



FIG. 8



Thus Drawing is a reproduction of this Original on a reduced scale.

